Most2 Silicon Detector DAQ

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Information from last meeting

- Silicon detector prototype for beam test

- Number of Ladders: at least 3 double-sided ladders, up to 6 double-sided ladders

- Number of Taichu chips on one ladder: 20 chips per ladder or 10 chips per FEE board

- Work mode: Triggered mode / Triggerless mode
  - The default acquisition mode used in the test beam will be the triggered mode.
  - If work in Triggerless mode, only 2 chips on the ladder will be enabled for data collection

- Data zero suppression will be done within Taichu chip

- FEE Readout via SiTCP (1GbE)

- Front-end Electronics boards:
  - Data Readout boards – collect sensor frame data and send to DAQ
  - External trigger signal fan-out - provides common trigger signal to all Readout boards
  - Start signal fan-out – starts Taichu chips to output frame data

Configuration Parameters and Data format need for DAQ development

- Configuration Information sent to FEE: registers addresses + parameters

- Data format of Taichu Chip: chip head + chip data + chip tail
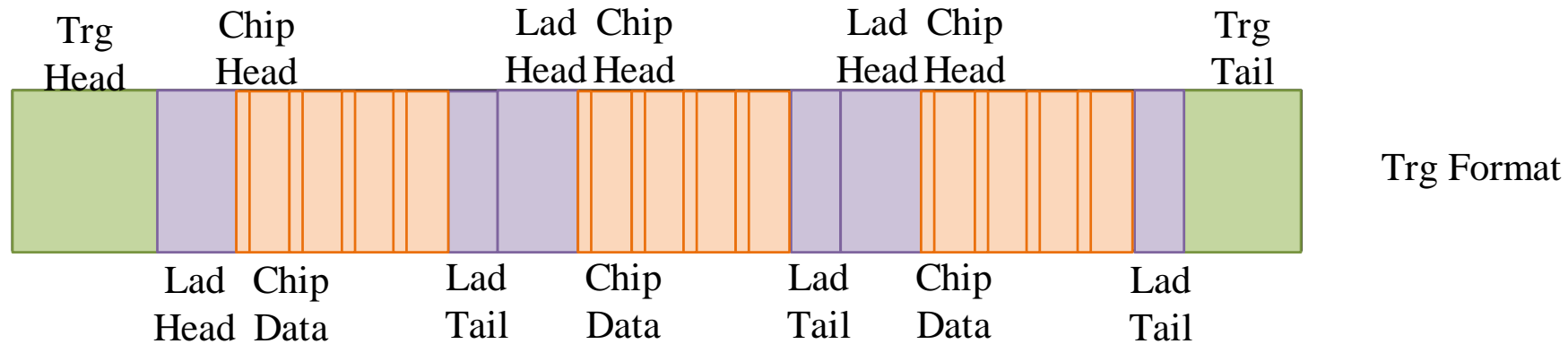- Data format of FEE: ladder head + Chip Data + Ladder Data Tail

3 double-sided ladders
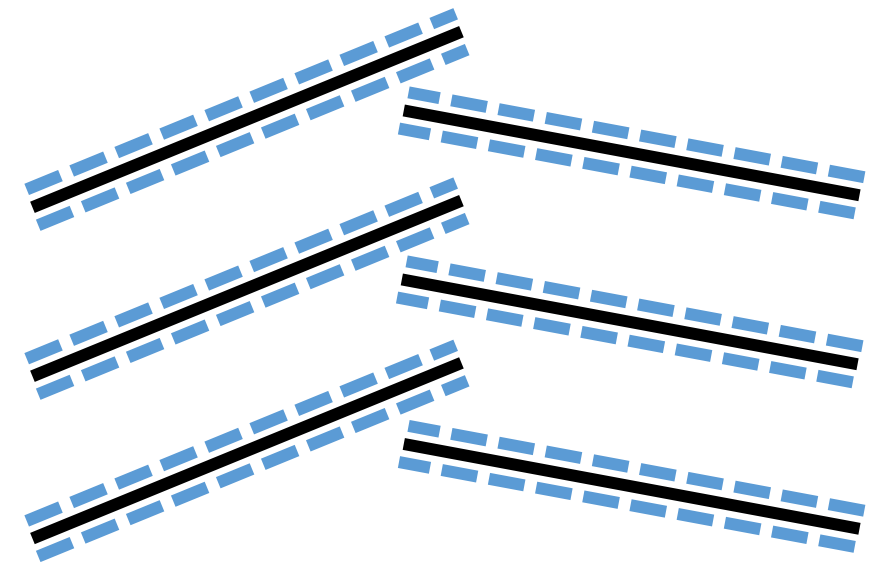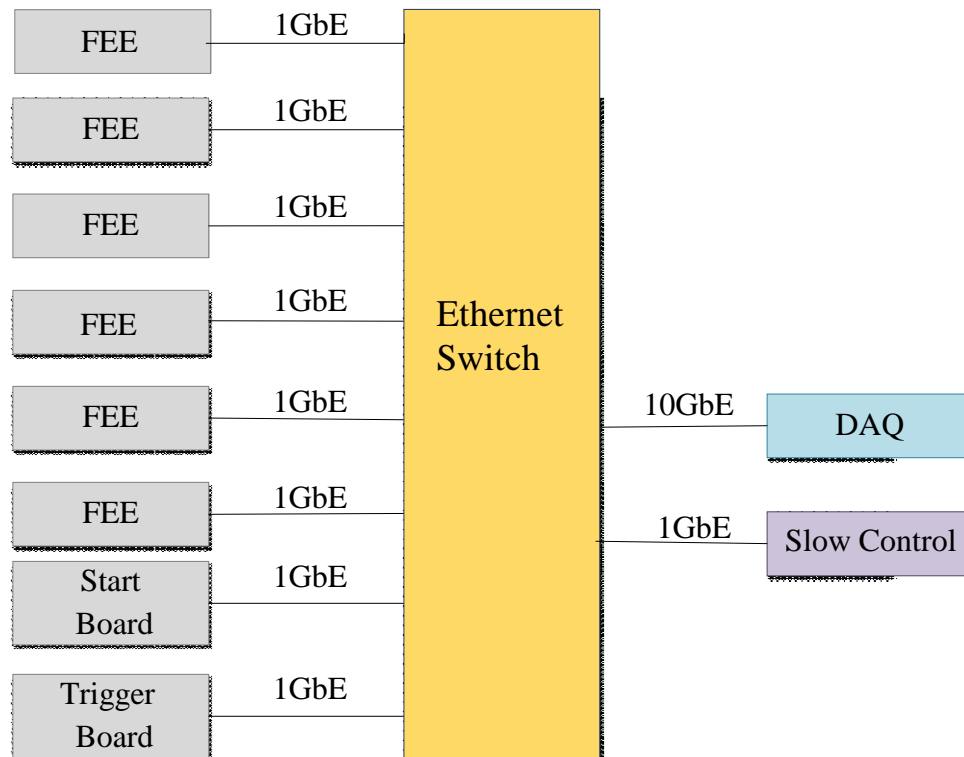
6 double-sided ladders

Most2 Silicon Detector DAQ Data Format

Raw data of sensors is eventually wrapped up with headers and trailers into DAQ data package for offline physics analysis


Trg Format

$$1 \text{ Chip Format} = n * (\text{Chip Head} + \text{Chip Data})$$
$$1 \text{ Ladder Format} = 1 \text{ Ladder Head} + n * \text{Chip Format} + 1 \text{ Ladder Tail}$$
$$1 \text{ Trg Format} = 1 \text{ Trg Head} + n * \text{Ladder Format} + 1 \text{ Trg Tail}$$

Chip Head	=	uint32_t Head Flag
Ladder Head	=	uint32_t Head Flag
	+	uint32_t Frame Count
	+	uint32_t Pack Length
	+	uint32_t Trigger ID

Ladder Tail	=	uint32_t Tail Flag
Trg Head	=	uint32_t Head Flag
	+	uint32_t Trigger ID
	+	uint32_t Pack Length
	+	uint8_t Pack State
Trg Tail	=	uint32_t Tail Flag

Silicon Detector DAQ

- Linux / C++ / Java
- FEE configuration
- Multi-thread Data Readout
- event building
- Data storage
- Sensor frame data process and hit map display
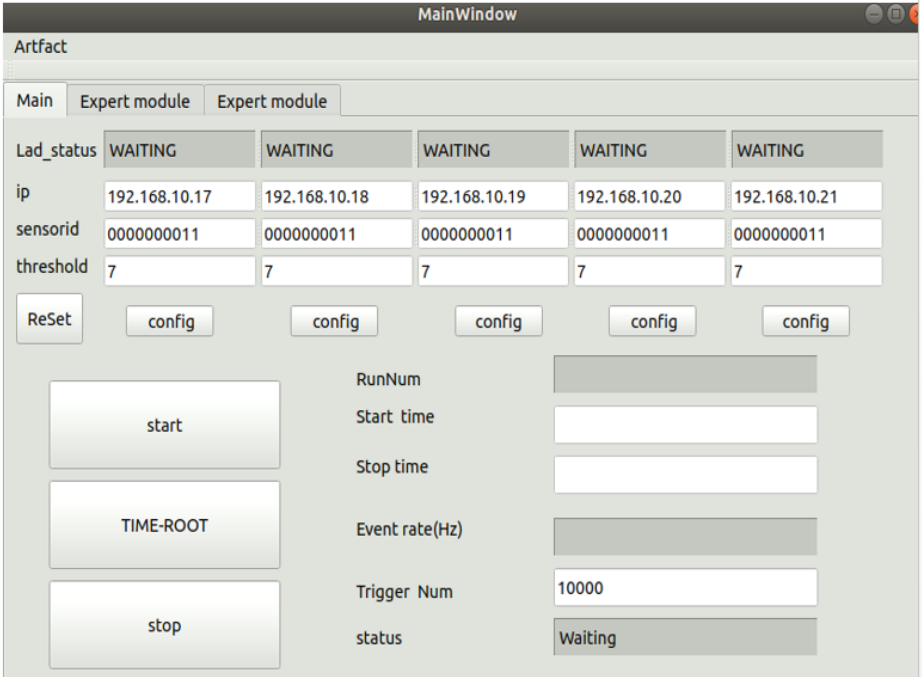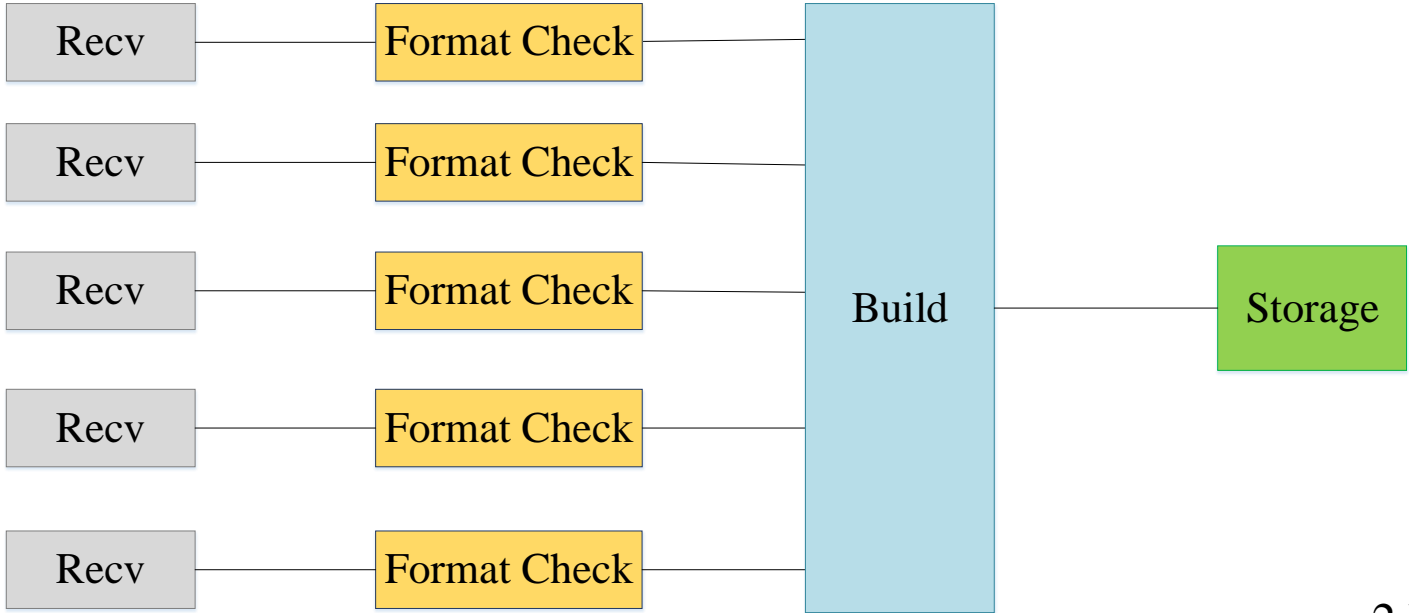
Radiation test

2 IPC (Industrial Personal Computer) for data acquisition

Future Plan

- 2020.08 – 2021.05
  - develop DAQ software for prototype detector
  - use simulated data
  - better to know sensor & FEE data format and configuration information earlier
- 2021.06 – 2021.10
  - test with FEE boards
  - test with Ladders & FEE boards
- 2022.01 –
  - Prepare for beam test

The end

Thank you!